What Is Claimed Is:

1. Apparatus for oxygenating and pumping blood comprising:

a housing;

a gas removal system coupled to the housing;

a blood oxygenation element disposed within the housing; and

a pump coupled in fluid communication with the blood oxygenation element.

2. The apparatus of claim 1 wherein the gas removal system comprises:

a sensor that detects the presence of gas within the housing and outputs a signal; and

a controller that controls operation of the apparatus responsive to the signal.

3. The apparatus of claim 2 wherein the gas removal system further comprises:

a line adapted to be coupled to a suction source; and

a valve coupled to the line between the housing and the suction source,

wherein the valve is operated responsive to the controller.

4. The apparatus of claim 1 wherein the blood oxygenation element comprises an annular fiber bundle.

5. The apparatus of claim 4 wherein the housing includes a central void and the annular fiber bundle is disposed surrounding the central void.

6. The apparatus of claim 5 wherein the gas removal system further comprises a filter element disposed at least partially in the central void.

7. The apparatus of claim 6 wherein the filter element further comprises at least one baffle.

8. The apparatus of claim 5 wherein the gas removal system further comprises a filter element disposed at an inlet to the central void, the filter element comprising a pleated material.

9. The apparatus of claim 1 wherein the housing includes a blood inlet manifold and a blood outlet manifold, and the blood inlet manifold is disposed on a diametrically opposite side of the housing from the blood outlet manifold.

10. The apparatus of claim 9 wherein the pump is disposed within the housing.

11. The apparatus of claim 1, further comprising a heat exchanger mounted to the housing.

12. Apparatus for oxygenating and pumping blood comprising:

a housing;

a blood oxygenation element having an annular fiber bundle disposed within the housing surrounding a central void, the blood oxygenation element having an inlet and an outlet, the inlet being disposed on a diametrically opposite side of the annular fiber bundle from the outlet; and

a pump coupled in fluid communication with the blood oxygenation element, the pump having a pump inlet and a pump outlet coupled to the inlet.

13. The apparatus of claim 12 wherein the housing includes an inlet manifold and an outlet manifold, the inlet manifold extending along a first side of the housing and the outlet manifold extending along a diametrically opposite side of the housing.

14. The apparatus of claim 13 wherein the housing further includes a relief area on an interior wall of the housing opposite to at least one of the inlet manifold and the outlet manifold.

15. The apparatus of claim 12 wherein the pump is mounted within the housing below the blood oxygenation element.

16. The apparatus of claim 12, further comprising a gas removal system.

17. The apparatus of claim 16 wherein the gas removal system comprises:

a sensor that detects the presence of gas within the housing and outputs a signal; and

a controller that controls operation of the apparatus responsive to the signal.

18. The apparatus of claim 17 wherein the gas removal system further comprises:

a line adapted to be coupled to a suction source; and

a valve coupled to the line between the housing and the suction source,

wherein the valve is operated responsive to the controller.

19. The apparatus of claim 16 wherein the gas removal system further comprises a filter element disposed at least partially in the central void.

20. The apparatus of claim 16 wherein the filter element further comprises at least one baffle.

21. The apparatus of claim 16 wherein the gas removal system further comprises a filter element disposed at an inlet to the central void, the filter element comprising a pleated material.

22. A gas removal system for removing air from blood, comprising:

a housing having an interior, a blood inlet and a blood outlet;

a sensor positioned to sense gas within the interior of the housing; and

a filter element disposed within the interior of the housing.

23. The gas removal system of claim 22 wherein the filter element is substantially cylindrical

24. The gas removal system of claim 23 wherein the filter element comprises a pleated material.

25. The gas removal system of claim 22, wherein the sensor uses a sensing technique selected from the group consisting of: detection by capacitance, direct resistance, light absorbance, light refractance, and ultrasonic energy transmittance.

26. The gas removal system of claim 22, further comprising a valve operably coupled to the sensor, the valve opening responsive to detection of gas by the sensor.

27. The gas removal system of claim 22, further comprising at least one baffle disposed within the filter element.

28. Apparatus for removing gas from a blood flow, comprising:

a housing having an interior;

an inlet leading to the interior;

an outlet coupled to the interior for removing blood from the interior;

a filter element disposed within the housing and positioned to separate the inlet from outlet so that blood entering the inlet must pass through the filter element; and

a sensor coupled to the housing, the sensor determining whether gas is present.

29. The apparatus of claim 28 wherein the inlet directs the blood in a substantially tangential direction so that blood initially circulates within the interior.

30. The apparatus of claim 28 wherein th sensor is operably coupled to a valve, the valve opening when the sensor determines that gas is present.

31. The apparatus of claim 28 wherein the valve is adapted to be coupled to a source of suction.

32. A method of priming a blood handling system, comprising the steps of:

providing a gas removal system, a blood oxygenation element and a pump, the gas removal device having a sensor that detects whether the presence of gas, the sensor operably coupled to a valve that opens when gas is detected by the sensor to permit removal of the gas;

coupling the gas removal device, blood oxygenation element and pump to an arterial cannulae and a venous cannulae; and

priming the system with blood or saline to remove air from the system by activating the gas removal system.

33. The method of claim 31 wherein the providing step is carried out with the gas removal device being mounted to a common housing with at least one of the pump and the blood oxygenation element.

34. The method of claim 33 wherein the providing step is carried out with the gas removal device being mounted a housing that encloses the pump and the blood oxygenation element.